

Accelerated Site Technology Deployment

Technology Fact Sheet

Deployment of Innovative Characterization Technologies and Implementation of the MARSSIM Process at Radiologically Contaminated Sites

Chicago Operations Office/Brookhaven National Laboratory Site

In Partnership with the Office of Science & Technology

Introduction

The Brookhaven Graphite Research Reactor (BGRR) was a graphite-moderated, air-cooled, thermal neutron research reactor that operated from 1950 through 1968. Many of the major BGRR sub-components are scheduled for near-term D&D including the pile fan sump, above and below ground air ducts, and auxiliary buildings that house fans, filters, instruments, fuel transfer canal and water treatment systems. Characterization of these facilities prior to, during, and after dismantlement will be conducted using state-of-the-art techniques and equipment to minimize worker exposure and to plan for appropriate disposition of the waste. Conventional characterization techniques require extensive sampling and analyses which are costly, time consuming, and can result in high levels of personnel exposure.

To address the Site's needs, the DOE Office of Science and Technology (EM-50) has partnered with the Chicago Operations Office and Brookhaven National Laboratory in an Accelerated Site Technology Deployment (ASTD) project. EM-50 is providing a total of \$1.54M of funding over two years for deployment of the innovative Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and characterization using *in situ* gamma spectroscopy. A Canberra *In situ* Object Counting System (ISOCSS) will be deployed to take field characterization data for BGRR D&D planning and will then be applied during on-going D&D activities to minimize worker exposure and ensure proper disposition of the resulting waste that is generated.

Technical Need

Baseline characterization involves taking thousands of smears, physical samples and cores,

sending samples for analysis on and off-site, compiling the information in a data base and reviewing the data for quality assurance. Many of the areas requiring characterization are not readily accessible, further complicating the process. In addition to being time consuming and costly, the baseline approach can result in high radiation exposures to personnel. Traditional gamma spectroscopy has meant a major investment for purchase and eventual disposal of a variety of calibration sources, matching the geometry and matrix of the expected contaminated medium. For each new geometry, a new calibration standard and hours of calibration are required. This has limited *in situ* gamma spectrum analysis to simple geometries and contamination distributions.



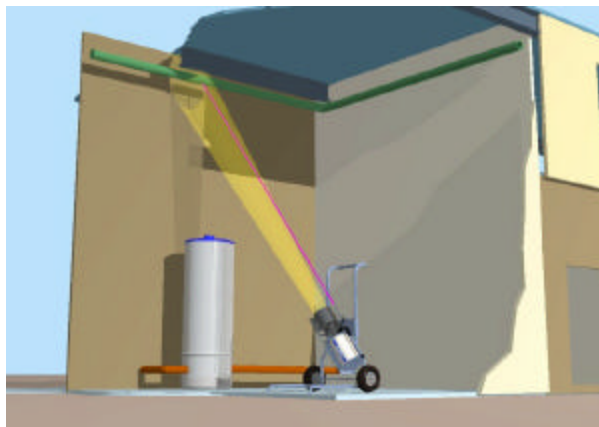
BGRR Fan House and Instrument House

System Description

The MARSSIM approach provides information on planning, conducting, evaluating, and documenting environmental radiological surveys of soil and building materials for optimizing the sampling process and demonstrating compliance with regulations. It has primarily been used in final status surveys; its application for D&D characterization is novel. The MARSSIM



approach involves identifying Data Quality Objectives to establish the types of data needed and the confidence level required. Data validation and verification as well as data quality assessment are covered through implementation of a Quality Assurance Project Plan.



Canberra ISOCS system measuring contamination in pipes

The ISOCS system is equipped with a broad energy intrinsic germanium detector capable of covering energies from 3 keV to 3 MeV with high efficiencies and resolution. Its sensitivity allows easy detection of both low energy spectra associated with transuranic isotopes and higher energy fission product spectra. The ISOCS unit is mounted on a field deployable cart and includes shielding and collimators, a battery powered multi-channel analyzer, and portable computer. ISOCS detector calibration using Monte Carlo modeling and discrete ordinate calculations eliminates the need for traditional calibration with radioactive sources. Pre-programmed geometry templates in the analysis software enable the designation of complex contamination distributions (e.g., an inaccessible contaminated pipe within a wall) and resulting quantification of the contamination therein.

Benefits

For more information about deployment of Innovative Characterization Technologies and Implementation of the MARSSIM Process at Radiologically Contaminated Sites

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Using the MARSSIM to guide the characterization process will help optimize the survey design, reducing or eliminating unnecessary samples, saving both time and money.

In situ gamma spectroscopy has been demonstrated to be cost-effective in applications where field sampling and lab analyses are used to characterize radiologically contaminated materials. Results are obtained in the field without having to wait for shipping and analyzing samples. Spectroscopy can be conducted remotely, minimizing personnel exposure. Non-homogeneous distributions are easily accounted for by collimating to appropriately larger areas. Internal calibration without radioactive sources improves accuracy, saves money and accelerates project schedule. The ISOCS geometry templates permit quick and accurate *in situ* analysis of complex contaminated facilities that previously would have required extensive time, effort and exposure of workers to characterize.

Implementation of MARSSIM and *in-situ* gamma spectroscopy to characterize BGRR is projected to save \$1,092K, which represents a 23% cost reduction compared to the baseline approach.

Status

A Deployment Plan was written and issued, but is currently being updated to reflect recent programmatic changes within the BGRR project. Team members including the DOE Environmental Measurements Laboratory, Bechtel Hanford (secondary deployment site), and subcontractors from Dames and Moore and Canberra have all been assembled. Preliminary training for ISOCS has been completed and equipment delivery is anticipated by the end of July 1999. Following set-up, shakedown testing and field training, initial deployment is scheduled to begin in August 1999 and conclude in August 2000.